In Situ Instruments and MEMS Breakout Group

Participants:

E. Tubbs, L. Dorsky, M. Hecht (JPL)
T. Kenny, T. Pfafman (Stanford)
N. Eaker (SwRI)
D. Cardarelli (MSSA)
D. Johnson (TiNI Alloy Co.)
V. Kantsioras (Hughes)

Objectives:

- Identify new technology directions for the IPDT outside the expertise of current members
- Suggest new mission types which meet IPDT validation needs
- Discuss member selection process

Sensor Network Architectures

What?

- A network to allow for flexible configurations of: mechanical sensors (e.g. strain gage) for deployment, impact damage, structural degradation; contamination monitors; fields; voltages; temperatures and pressures; leaks;, etc.
- Possible implementation as wireless or plug & socket devices meeting specific interface, mechanical, electrical, thermal specifications.
- Recognize two distinct varieties - science networks and health networks. Limit scope to health networks because science nets are likely to be too application specific (see “building blocks”)

Sensor Network Architectures (cont.)

Why?

- Want to have *many* sensors to allow for condition-based maintenance, “remote agent” functions.
- Want *negligible* impact of sensors on spacecraft to allow for late addition of sensors to address hardware deficiencies (Galileo antenna?)

Possible Validation

- A network with sockets for a specific number of modular sensors with designated interface protocol. Sensor suite to be selected and provided during ATLO.

Electronic Building Blocks

What?

- Catalog and/or inventory of ASICS, protocols, packages for instruments (e.g. ASICS for pulse height analysis, temperature regulation)

Why?

- Encourages developers to design instruments around electronics (much as they are designed around processors or power supply conventions).

Actuators

What?

- Flexures, small inflatables, vacuum pumps and manipulators, magnetic & optical, bimetals, phase transition (shape memory, thermopneumatic), reaction wheel

Why?

- Sampling, deployment, mobility, pointing, separation, devices

Other Topics

- Micro-robotics
- Navigation grade accelerometers
- Preservation methods for sample return
- In situ age dating

Technology Development Announcement

Suggestions

- Maintain short format, narrow scope, clarify expectations
- Encourage small business
- Give more indication of potential funding for flight validation (0.2-2.0 $M?)
- Broaden “applicability” criterion to emphasize building blocks, pipeline technologies
- Broaden “maturity” criterion to include 5-10 year lead time items
- Broaden “capability” criterion to include team applications (same institution)

Possible Validation flights

Overview

- MEMS technologies, particles & fields can be validated on most mission types
- Piggyback missions (SQUIRTS, MightySats, etc.) are ideal for MEMS validation
- Principal need is for opportunities to validate physical & chemical science sensors/instruments

Suggestions

- Sample selection & return (the moon?)
- Small body flyby with impact probes (like DS-1 with possible solar sail?)
- Networks of microlanders
- Aerobot